Work Order ID 91808

91808

October-18-12 2:44:27 PM

Item ID: D6008-132 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Crosstube extrusion

Start Date: 10/18/12 **Start Qty:** 15.00 ~~*15*~~ 20

Required Date: 12/21/12 **Req'd Qty:** 15.00 ~~*15*~~ *15*

Reference:

Cust Item ID:

Customer:

Run Start *NR1*

Stop *NR2*

Approvals: **Process Plan:** CL **Date:** 12/10/19 **Tooling:** _____ **Date:** _____

QC: _____ **Date:** _____ **SPC (Y/N):** _____ **Date:** _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	**Revision Nbr**								
D6008	Rev A								
100		0.00							
100	PURCHASING								
Purchasing		0.00							
Purchasing	**Memo** Issue P/O: 18177 a) Order as per Dwg D6008 b) Material: 3.250 x 0.438 wall 7075-T6/T6511 (WW-T-700/7 or QQ-A-225/9 or QQ-A-200/11) seamless aluminum tube c) Minimum ultimate tensile strength = 77 ksi d) Minimum tensile yield strength = 66 ksi e) Tolerance are per ASTM B210 (see details on Dwg D6008) f) Material certification required								
110	Receive & Inspect for Damage & Mat'l Certs	0.00							
110									
Packaging		0.00							
Packaging	**Memo** Ensure material certification is attached								

CL 12/10/19 15

12/3/19

DQA: _____ Date: _____

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: Date:

Work Order: _____

Part No. _____

NCR No. _____

DISPOSITION

- Rework ☐
- Scrap ☐
- Use-as-is ☐
- Work Order Update ☐

AGAINST DEPARTMENT/PROCESS

- Skid-tube ☐
- Machining ☐
- Thermoforming ☐
- Large Fab ☐
- Crosstube ☐
- Small Fab ☐
- Finishing ☐
- Composite ☐
- Water Jet ☐
- Prod. Eng. Coor. ☐
- Rec/Store/Packaging ☐
- Supplier ☐
- Engineering ☐
- Quality ☐
- Other ☐

Root Cause		Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Doc/Data	☐									
Equip/Tooling	☐									
Operator	☐									
Material	☐									
Setup	☐									
Other	☐									
Process	☐									
Supplier	☐									
Training	☐									
Unapproved	☐									

FAULT CATEGORY

Landing Gear

- ☐ Bending
- ☐ Centre Not Concentric to O/S
- ☐ Cracks
- ☐ Crushed/Crimped
- ☐ Cuffs
- ☐ Heat Treat
- ☐ Inspection Strip in Tube
- ☐ Ripples in Bend
- ☐ Torque Waves in Extrusion
- ☐ Turning Sequence
- ☐ Wave/Twist in Tube

General

- ☐ Bend
- ☐ BOM/Route
- ☐ Broken/Damaged
- ☐ Burrs
- ☐ Contamination
- ☐ Countersink
- ☐ Cut Too Short
- ☐ Drill Holes
- ☐ Drawing
- ☐ Finish
- ☐ Folio
- ☐ Grain
- ☐ Hardware
- ☐ Inspection Incomplete
- ☐ Instructions Incomplete/Unclear
- ☐ Maintenance
- ☐ Mislabeled
- ☐ Misread
- ☐ Offset
- ☐ Out of Calibration
- ☐ Out of Sequence
- ☐ Outside Dimensions
- ☐ Ovalized
- ☐ Over/Under tolerance
- ☐ Part Incorrect
- ☐ Part Lost/Missing
- ☐ Part Moved
- ☐ Positioned Wrong
- ☐ Power Loss/Surge
- ☐ Pressure/Forced
- ☐ Temperature/Cure
- ☐ Weld
- ☐ Wrong Stock Pulled
- ☐ Other

_____

_____

_____

Work Order ID 91808

91808

October-18-12 12:44:27 PM

Item ID: D6008-132 **Accept** *N900040100* **Setup Start** *NS1*

Revision ID: **Stop** *NS2*

Item Name: Crosstube extrusion

Start Date: 10/18/12 **Start Qty:** 15.00 *15* **Cust Item ID:**

Required Date: 12/21/12 **Req'd Qty:** 15.00 *15* **Customer:**

Reference:

Run Start *NR1*

Stop *NR2*

Approvals: **Process Plan:** _____ **Date:** _____ **Tooling:** _____ **Date:** _____

QC: _____ **Date:** _____ **SPC (Y/N):** _____ **Date:** _____

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
120	QC6- Inspect dimensions to drawing	0.00							
120									
QC	**Memo**	0.00							
Quality Control	Ensure Material certification comply to Dwg D6005								
130	Identify as per dwg & Stock Location: 26	0.00							
130	MAT 24 / MAT 26								
Packaging	**Memo**	0.00							
Packaging									
140	QC21- Final Inspection - Work Order Release	0.00							
140									
QC	**Memo**	0.00							
Quality Control									

DAS 16 8-89 13/05/03

Please see Attached Inspection Reports.

KC 13-5-3

MLS 13-05-06

gl 13-05-3

DQA: _____ Date: _____

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: Date:

Work Order: _____

Part No. _____

NCR No. _____

DISPOSITION

- Rework ☐
- Scrap ☐
- Use-as-is ☐
- Work Order Update ☐

AGAINST DEPARTMENT/PROCESS

- Skid-tube ☐
- Machining ☐
- Thermoforming ☐
- Large Fab ☐
- Crosstube ☐
- Small Fab ☐
- Finishing ☐
- Composite ☐
- Water Jet ☐
- Prod. Eng. Coor. ☐
- Rec/Store/Packaging ☐
- Supplier ☐
- Engineering ☐
- Quality ☐
- Other ☐

Root Cause		Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Doc/Data	☐									
Equip/Tooling	☐									
Operator	☐									
Material	☐									
Setup	☐									
Other	☐									
Process	☐									
Supplier	☐									
Training	☐									
Unapproved	☐									

FAULT CATEGORY

Landing Gear

- ☐ Bending
- ☐ Centre Not Concentric to O/S
- ☐ Cracks
- ☐ Crushed/Crimped
- ☐ Cuffs
- ☐ Heat Treat
- ☐ Inspection Strip in Tube
- ☐ Ripples in Bend
- ☐ Torque Waves in Extrusion
- ☐ Turning Sequence
- ☐ Wave/Twist in Tube

General

- ☐ Bend
- ☐ BOM/Route
- ☐ Broken/Damaged
- ☐ Burrs
- ☐ Contamination
- ☐ Countersink
- ☐ Cut Too Short
- ☐ Drill Holes
- ☐ Drawing
- ☐ Finish
- ☐ Folio
- ☐ Grain
- ☐ Hardware
- ☐ Inspection Incomplete
- ☐ Instructions Incomplete/Unclear
- ☐ Maintenance
- ☐ Mislabeled
- ☐ Misread
- ☐ Offset
- ☐ Out of Calibration
- ☐ Out of Sequence
- ☐ Outside Dimensions
- ☐ Ovalized
- ☐ Over/Under tolerance
- ☐ Part Incorrect
- ☐ Part Lost/Missing
- ☐ Part Moved
- ☐ Positioned Wrong
- ☐ Power Loss/Surge
- ☐ Pressure/Forced
- ☐ Temperature/Cure
- ☐ Weld
- ☐ Wrong Stock Pulled
- ☐ Other

_____

_____

_____

Picklist Print

October-18-12 2:44:26 PM

Work Order ID: 91808

Parent Item: D6008-132

Parent Item Name: Crosstube extrusion

Start Date: 10/18/12 **Required Date:** 12/21/12

Start Qty: 15.00 **Required Qty:** 15.00

Comments: IPP Rev:A New Issue 07-06-18 JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6008-132P Crosstube extrusion		Purchased	No			110	Each	20.0000	1	15			

Location	Loc Qty	Loc Code	
lhall	20		
69799	20		

DQA: _____ Date: _____

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: Date:

Work Order: _____

Part No. _____

NCR No. _____

DISPOSITION

- Rework ☐
- Scrap ☐
- Use-as-is ☐
- Work Order Update ☐

AGAINST DEPARTMENT/PROCESS

- Skid-tube ☐
- Machining ☐
- Thermoforming ☐
- Large Fab ☐
- Crosstube ☐
- Small Fab ☐
- Finishing ☐
- Composite ☐
- Water Jet ☐
- Prod. Eng. Coor. ☐
- Rec/Store/Packaging ☐
- Supplier ☐
- Engineering ☐
- Quality ☐
- Other ☐

Root Cause		Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Doc/Data	☐									
Equip/Tooling	☐									
Operator	☐									
Material	☐									
Setup	☐									
Other	☐									
Process	☐									
Supplier	☐									
Training	☐									
Unapproved	☐									

FAULT CATEGORY

Landing Gear

- ☐ Bending
- ☐ Centre Not Concentric to O/S
- ☐ Cracks
- ☐ Crushed/Crimped.
- ☐ Cuffs
- ☐ Heat Treat
- ☐ Inspection Strip in Tube
- ☐ Ripples in Bend
- ☐ Torque Waves in Extrusion
- ☐ Turning Sequence
- ☐ Wave/Twist in Tube

General

- ☐ Bend
- ☐ BOM/Route
- ☐ Broken/Damaged
- ☐ Burrs
- ☐ Contamination
- ☐ Countersink
- ☐ Cut Too Short
- ☐ Drill Holes
- ☐ Drawing
- ☐ Finish
- ☐ Folio
- ☐ Grain
- ☐ Hardware
- ☐ Inspection Incomplete
- ☐ Instructions Incomplete/Unclear
- ☐ Maintenance
- ☐ Mislabeled
- ☐ Misread
- ☐ Offset
- ☐ Out of Calibration
- ☐ Out of Sequence
- ☐ Outside Dimensions
- ☐ Ovalized
- ☐ Over/Under tolerance
- ☐ Part Incorrect
- ☐ Part Lost/Missing
- ☐ Part Moved
- ☐ Positioned Wrong
- ☐ Power Loss/Surge
- ☐ Pressure/Forced
- ☐ Temperature/Cure
- ☐ Weld
- ☐ Wrong Stock Pulled
- ☐ Other

_____

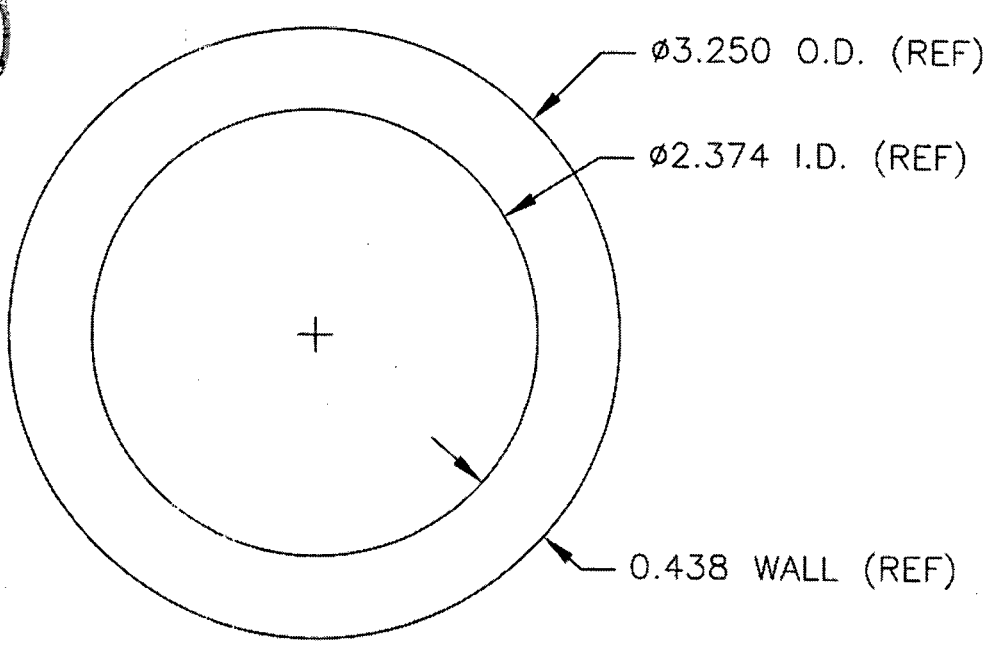
_____

_____

DESIGN	DRAWN BY	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA
CHECKED	APPROVED	DRAWING NO. D6008 REV. A SHEET 1 OF 1
DATE 00.11.17		TITLE CROSSTUBE MATERIAL SCALE 1:1
A	00.11.17	NEW ISSUE

SPECIFICATION CONTROL DRAWING

RELEASED
00.11.24



NOTES

1) D6008–XXX CROSSTUBE
LENGTH

WHERE XXX IS LENGTH IN INCHES
EG. 180" LONG TUBE: D6008–180

CL 12/10/19
WO: 91808

2) MATERIAL: 3.250 OD x 0.438 WALL 7075–T6/T6511 (WW–T–700/7 OR QQ–A–225/9 OR QQ–A–200/11) SEAMLESS ALUMINUM TUBE.
MINIMUM ULTIMATE TENSILE STRENGTH = 77 ksi
MINIMUM YIELD TENSILE STRENGTH = 66 ksi
3) TOLERANCES ARE PER ASTM B210 AS FOLLOWS:
O.D.: ± 0.008 MEAN (±0.016 INCLUDING OVALITY)
WALL: ±0.020 MEAN (±0.044 INCLUDING ECCENTRICITY)
LENGTH: XXX +0.125/–0.000
STRAIGHTNESS: 0.010" DEVIATION / 12" LENGTH
4) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
5) CHEMICAL CONVERSION COAT PER DART QSI 005 4.1

Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7
Tel: 613 632 9577
Fax: 613 632 1053

PURCHASE ORDER

Purchase Order ID PO18177

Purchase Order Date 10/19/12
PO Print Date 10/19/12

Order From : VU-ALU001

ALUMINIUMWERK UNNA AG
630 3033 SOUTH PARKER RD
AURORA, CO 80014
USA

Contact Name		**Buyer**	Chantal Lavoie
Vendor Phone	303 755 5672	**Requisition Nbr**	
Vendor Fax	303 755 5936	**Tax Resale Nbr**	10127-2607
Vendor Account Nbr		**Terms**	Wire
		Currency	USD
		FOB	Destination-Collect

FAXED

Ship To : DART AEROSPACE LTD 1270 ABERDEEN
HAWKESBURY, ON K6A 1K7
CANADA

REVISED

Line Nbr	Reference / Revision ID / Vendor Part Number	Description / Mfg ID	Req Date / Taxable	Req Qty / Unit of Measure	Ship Method	Unit Price	Extended Price
1	D6008-132P	Crosstube extrusion	12/21/12 Yes	20.00 Each		$753.0000	$15,060.00

Nec/19 23/3/24

Special Inst: AS PER DWG D6008 REV. A
B91808
MATERIAL: 7075-T6/T6511 AS PER WW-T-700/7 OR
QQ-A-200/11 OR QQ-A-225/9 SEAMLESS ALUMINUM TUBE
MINIMUM ULTIMATE TENSILE STRENGTH = 77 KSI
MINIMUM TENSILE YIELD STRENGTH = 66 KSI
SIZE: 3.250 X 0.438 WALL
TOLERANCE ARE PER ASTM B210

PO Total: **$15,060.00**

CERTIFICATE OF CONFORMITY REQ'D UPON DELIVERY

CL

No substitution or deviation without consent.
Certificate of Conformity or Material Certification required (YES) NO

Change Nbr: 2 **Change Date:** 10/19/12

ALUnna TUBES

Packinglist ALUnna AG

ALUnna ref. no.	47926/100
Customer PO.	Po. 18177
Date:	02.18.13

Boxmarking:

Dart Aerospace	Po. 18177
D6008-132	
Made in Germany	Dest.: Hawkesbury Ont, Canada

We hereby declare that the wooden packing material are totally free from bark and apparently free from live plant pests

Item no.	Box no.	OD (inch)	ID (inch)	Wall (inch)	Net Weight (lbs)	Tare lbs	Gross Weight	Pieces	lengths (ft)	Boxdimension Lengths (inch)	Width (inch)	height (inch)	Cast. / Heat No. Top	Pcs.	Cast. / Heat No. Middle	Pcs.	Cast. / Heat No. Bottom
100	1	3,250	2,374	0,438	988	223	1210	19	11	151,575	22,441	22,441			8502/1401479	19	
					988	**223**	**1210**	**19**				1,251 m³					

S:\VERSAND\USA_Packliste\47926_100

Abnahmeprüfzeugnis 3.1 - DIN EN 10204:2005

Inspection Certificate 3.1 - DIN EN 10204:2005 / Certificat de Reception 3.1- DIN EN 10204:2005

Kunde: *Client:* Dart Aerospace Ltd.

1270 Aberdeen Street
K6A1K7 Hawkesbury, ON Canada

Zeugnisnummer: *Cert No.: / No. du certificat:* 1797/12

Bestellnummer: *Order No. / No. de commande* PO 18177

Produkt: *Product / Produit:* Rohre nahtlos gepresst *Tubes seamless extruded*

Auftrag: *Our Reference/Notre Reference:* 47926/100

Spezifikation: *Specification:* AMS - QQ - A - 200/11; Spezifikation Dart Aerospace D6008

Werkstoff: *Alloy/Alliage:* 7075 5 13/05/07

Zustand: *Temper/État* T 6511

Abmessung *Size / Dimension* 3,250 INCH x 2,374 INCH x 0,438 INCH x 132,000 INCH
D6008-132 3.250 X 0.438 X 132

Kennzeichnung *Marking/Marquage:* ALUnna - Cert No. 1797/12 - 7075-T6511 - Cast. No. 8502 - AMS QQA 200/11 - 3.250" OD X 0.438" Wall - Heat Lot No. 1401479 - ALUnna Order Conf. No. 47926/100-1 PO. 18177

Lieferung *Delivered Material / Matérial délivre:*

	pcs.	lbs
	19	988

Country of Manufacture: Germany
Products are in accordance with applicable RoHS

1. Chemische Analyse — *Chemical Analysis / analyse chimique*

Other elements each max. 0,05 %, total 0,15 %

Charge/ Cast No.		Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Pb	Zr	Bi	Sn	Ni
	min.			1,2		2,1	0,18	5,1						
	max.	0,40	0,50	2,0	0,30	2,9	0,28	6,1	0,20					
8502/12		0,092	0,183	1,486	0,060	2,549	0,220	5,803	0,046	0,003	0,0333	0,0001	0,0015	0,0001

Hydrogen content: 0,10 **ccm/100 g Al** Elements without indication < 0,01 % **country of melt manufacturer: Germany**

2. Mechanische Eigenschaften — *Mechanical Properties / Valeurs Mécaniques*

Anforderungen Requirements		tensile (Rm) ksi	yield (Rp0,2) ksi	elongation 2" %	elongation A %	Hardness HB	Heat Lot No.
	min.	77,0	66,0	7,0			
	max.						
1		88,305	81,055	9,0			1401479
2		86,855	79,170	10,0			

max. RMS 25 - max. 24,0 µ"

Ergebnis der Prüfungen: Es wird bestätigt, daß die Lieferung geprüft wurde und den Vereinbarungen bei der Bestellannahme entspricht

Test results: We confirm that the delivery has been tested and applies to the agreements made on receipt of the order

Resultats: Nous confirmons que la livraison a été controlée et correspond avec les conventions faites à la réception de la commande

mergardtri

02.01.2013

Certified acc. DIN EN ISO 9001:2008 and DIN EN 9100:2003
valid until 2013-11-10
Cert.- Reg. No.: 001959 QM08; 001959 ASH

ALUnna

Abnahmebeauftragter

EXTRUSION INSPECTION SHEET

		SIDE A	SIDE B					ULTRA SONIC MEASURMENTS				
TUBE #	TOTAL LENGTH	DIA two readings	DIA two readings	INSIDE DIA	wall thickness measured w/vern	Strightness at 12"in middle	Rockwell Reading	LOCATION on tube	R1	R2	R3	R4
DWG	132.00"	3.250"		2.374"	0.438"	0.010"	N/A	Middle	N/A			
1	132.00"	2.344"/2.348"	2.341"/2.348"	2.364"	0.423"/0.455"	0.004"	N/A	Middle	0.450"	0.437"	0.438"	0.447"
2	132.00"	2.354"/2.345"	2.340"/2.351"	2.364"	0.420"/0.436"	0.006"	N/A	Middle	0.451"	0.447"	0.424"	0.434"
3	132.00"	2.343"/2.247"	2.249"/2.251"	2.366"	0.434"/0.445"	0.0045"	N/A	Middle	0.443"	0.445"	0.442"	0.446"
4	132.00"	2.247"/2.248"	2.246"/2.251"	2.362"	0.436"/0.447"	0.005"	N/A	Middle	0.438"	0.448"	0.451"	0.447"
5	132.00"	2.250"2.251"	2.250"/2.251"	2.364"	0.445"/0.450"	0.0065"	N/A	Middle	0.451"	0.452"	0.441"	0.436"
6	132.00"	2.247"/2.252"	2.245"/2.248"	2.364"	0.439"/0.457"	0.0045"	N/A	Middle	0.451"	0.451"	0.436"	0.442"
7	132.00"	2.248"/2.252"	2.248"/2.253"	2.367"	0.434"/0.442"	0.0125"	N/A	Middle	0.452"	0.437"	0.437"	0.451"
8							N/A	Middle				
9							N/A	Middle				
10							N/A	Middle				
11							N/A	Middle				
12							N/A	Middle				
13							N/A	Middle				
14							N/A	Middle				
15							N/A	Middle				
PART # D6008-132		P/O# 18177			BATCH # B91808			Notes:				

MEAN OUTSIDE DIAMETER PERMISSIBLE +- 0.006 side A									
Tube #	Actual A	Actual B	Mean	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.244	2.248	2.246	3.250	0.006	3.244	3.256	-0.998	-1.010
2	2.234	2.245	2.240	3.250	0.006	3.244	3.256	-1.005	-1.017
3	2.243	2.247	2.245	3.250	0.006	3.244	3.256	-0.999	-1.011
4	2.247	2.248	2.248	3.250	0.006	3.244	3.256	-0.997	-1.009
5	2.250	2.251	2.251	3.250	0.006	3.244	3.256	-0.994	-1.006
6	2.247	2.252	2.250	3.250	0.006	3.244	3.256	-0.995	-1.007
7	2.248	2.252	2.250	3.250	0.006	3.244	3.256	-0.994	-1.006
8			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
9			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
10			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
11			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
12			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
13									
14									
15									
16									

MEAN OUTSIDE DIAMETER PERMISSIBLE +- 0.006 Side B									
Tube #	Actual A	Actual B	Mean	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.241	2.248	2.245	3.250	0.006	3.244	3.256	-1.000	-1.012
2	2.240	2.251	2.246	3.250	0.006	3.244	3.256	-0.999	-1.011
3	2.249	2.251	2.250	3.250	0.006	3.244	3.256	-0.994	-1.006
4	2.246	2.251	2.249	3.250	0.006	3.244	3.256	-0.996	-1.008
5	2.250	2.251	2.251	3.250	0.006	3.244	3.256	-0.994	-1.006
6	2.245	2.248	2.247	3.250	0.006	3.244	3.256	-0.998	-1.010
7	2.248	2.253	2.251	3.250	0.006	3.244	3.256	-0.994	-1.006
8			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
9			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
10			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
11			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
12			#DIV/0!		0.006	-0.006	0.006	#DIV/0!	#DIV/0!
13									
14									
15									
16									

OUTSIDE DIA. Permissible (with Ovality) +- 0.012 side A							
Tube #	Actual A	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.244	3.250	0.012	3.238	3.262	-0.994	-1.018
2	2.234	3.250	0.012	3.238	3.262	-1.004	-1.028
3	2.243	3.250	0.012	3.238	3.262	-0.995	-1.019
4	2.247	3.250	0.012	3.238	3.262	-0.991	-1.015
5	2.250	3.250	0.012	3.238	3.262	-0.988	-1.012
6	2.247	3.250	0.012	3.238	3.262	-0.991	-1.015
7	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
8			0.012	-0.012	0.012	0.012	-0.012
9			0.012	-0.012	0.012	0.012	-0.012
10			0.012	-0.012	0.012	0.012	-0.012
11			0.012	-0.012	0.012	0.012	-0.012
12			0.012	-0.012	0.012	0.012	-0.012
13							
14							
15							
16							

OUTSIDE DIA. Permissible (with Ovality) +- 0.012 side b							
Tube #	Actual A	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.241	3.250	0.012	3.238	3.262	-0.997	-1.021
2	2.240	3.250	0.012	3.238	3.262	-0.998	-1.022
3	2.249	3.250	0.012	3.238	3.262	-0.989	-1.013
4	2.246	3.250	0.012	3.238	3.262	-0.992	-1.016
5	2.250	3.250	0.012	3.238	3.262	-0.988	-1.012
6	2.245	3.250	0.012	3.238	3.262	-0.993	-1.017
7	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
8			0.012	-0.012	0.012	0.012	-0.012
9			0.012	-0.012	0.012	0.012	-0.012
10			0.012	-0.012	0.012	0.012	-0.012
11			0.012	-0.012	0.012	0.012	-0.012
12			0.012	-0.012	0.012	0.012	-0.012
13							
14							
15							
16							

OUTSIDE DIA. Permissible (with Ovality) +- 0.012 side A							
Tube #	Actual B	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
2	2.245	3.250	0.012	3.238	3.262	-0.993	-1.017
3	2.247	3.250	0.012	3.238	3.262	-0.991	-1.015
4	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
5	2.251	3.250	0.012	3.238	3.262	-0.987	-1.011
6	2.252	3.250	0.012	3.238	3.262	-0.986	-1.010
7	2.252	3.250	0.012	3.238	3.262	-0.986	-1.010
8			0.012	-0.012	0.012	0.012	-0.012
9			0.012	-0.012	0.012	0.012	-0.012
10			0.012	-0.012	0.012	0.012	-0.012
11			0.012	-0.012	0.012	0.012	-0.012
12			0.012	-0.012	0.012	0.012	-0.012
13							
14							
15							
16							

OUTSIDE DIA. Permissible (with Ovality) +- 0.012 side b							
Tube #	Actual B	Nominal	Tolerance	min allowable dimension	max allowable dimension	Results for min allowable	Results for max allowable
1	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
2	2.251	3.250	0.012	3.238	3.262	-0.987	-1.011
3	2.251	3.250	0.012	3.238	3.262	-0.987	-1.011
4	2.251	3.250	0.012	3.238	3.262	-0.987	-1.011
5	2.251	3.250	0.012	3.238	3.262	-0.987	-1.011
6	2.248	3.250	0.012	3.238	3.262	-0.990	-1.014
7	2.253	3.250	0.012	3.238	3.262	-0.985	-1.009
8			0.012	-0.012	0.012	0.012	-0.012
9			0.012	-0.012	0.012	0.012	-0.012
10			0.012	-0.012	0.012	0.012	-0.012
11			0.012	-0.012	0.012	0.012	-0.012
12			0.012	-0.012	0.012	0.012	-0.012
13							
14							
15							
16							

end measuement with vern

Mean OUTSIDE DIA. Permissible +- 0.015									
Tube	Actual A	Actual B	Mean	Nominal	Tolerance	min	max	min	max
1	**0.423**	**0.455**	**0.439**	**0.438**	**0.015**	**0.423**	**0.453**	**0.016**	**-0.014**
2	**0.420**	**0.436**	**0.428**	**0.438**	**0.015**	**0.423**	**0.453**	**0.005**	**-0.025**
3	**0.434**	**0.445**	**0.440**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0165**	**-0.014**
4	**0.436**	**0.447**	**0.442**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0185**	**-0.012**
5	**0.445**	**0.450**	**0.448**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0245**	**-0.006**
6	**0.439**	**0.451**	**0.445**	**0.438**	**0.015**	**0.423**	**0.453**	**0.022**	**-0.008**
7	**0.434**	**0.442**	**0.438**	**0.438**	**0.015**	**0.423**	**0.453**	**0.015**	**-0.015**
8			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
9			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
10			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
11			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
12			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
13			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
14			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
15			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!

OUTSIDE DIA. Permissible +- 0.038								
Tube	Actual A	Actual B	Nominal	Tolerance	min	max	min	max
1	**0.423**	**0.455**	**0.438**	**0.038**	**0.400**	**0.476**	**0.023**	**-0.021**
2	**0.420**	**0.436**	**0.438**	**0.038**	**0.400**	**0.476**	**0.020**	**-0.040**
3	**0.434**	**0.445**	**0.438**	**0.038**	**0.400**	**0.476**	**0.034**	**-0.031**
4	**0.436**	**0.447**	**0.438**	**0.038**	**0.400**	**0.476**	**0.036**	**-0.029**
5	**0.445**	**0.450**	**0.438**	**0.038**	**0.400**	**0.476**	**0.045**	**-0.026**
6	**0.439**	**0.451**	**0.438**	**0.038**	**0.400**	**0.476**	**0.039**	**-0.025**
7	**0.434**	**0.442**	**0.438**	**0.038**	**0.400**	**0.476**	**0.034**	**-0.034**
8				0.038	-0.038	0.038	0.038	-0.038
9				0.038	-0.038	0.038	0.038	-0.038
10				0.038	-0.038	0.038	0.038	-0.038
11				0.038	-0.038	0.038	0.038	-0.038
12				0.038	-0.038	0.038	0.038	-0.038
13				0.038	-0.038	0.038	0.038	-0.038
14				0.038	-0.038	0.038	0.038	-0.038
15				0.038	-0.038	0.038	0.038	-0.038

center measurment with ultra sonic

Mean OUTSIDE DIA. Permissible +- 0.015									
Tube	highest	lowest	Mean	Nominal	Tolerance	min	max	min	max
1	**0.450**	**0.437**	**0.444**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0205**	**-0.010**
2	**0.451**	**0.424**	**0.438**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0145**	**-0.016**
3	**0.446**	**0.442**	**0.444**	**0.438**	**0.015**	**0.423**	**0.453**	**0.021**	**-0.009**
4	**0.451**	**0.438**	**0.445**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0215**	**-0.009**
5	**0.452**	**0.436**	**0.444**	**0.438**	**0.015**	**0.423**	**0.453**	**0.021**	**-0.009**
6	**0.451**	**0.436**	**0.444**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0205**	**-0.010**
7	**0.452**	**0.437**	**0.445**	**0.438**	**0.015**	**0.423**	**0.453**	**0.0215**	**-0.009**
8			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
9			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
10			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
11			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
12			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
13			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
14			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!
15			#DIV/0!		0.015	-0.015	0.015	#DIV/0!	#DIV/0!

OUTSIDE DIA. Permissible +- 0.038								
Tube	highest	lowest	Nominal	Tolerance	min	max	min	max
1	**0.450**	**0.437**	0.438	0.038	0.400	0.476	0.050	-0.039
2	**0.451**	**0.424**	0.438	0.038	0.400	0.476	0.051	-0.052
3	**0.446**	**0.442**	0.438	0.038	0.400	0.476	0.046	-0.034
4	**0.451**	**0.438**	0.438	0.038	0.400	0.476	0.051	-0.038
5	**0.452**	**0.436**	0.438	0.038	0.400	0.476	0.052	-0.040
6	**0.451**	**0.436**	0.438	0.038	0.400	0.476	0.051	-0.040
7	**0.452**	**0.437**	0.438	0.038	0.400	0.476	0.052	-0.039
8				0.038	-0.038	0.038	0.038	-0.038
9				0.038	-0.038	0.038	0.038	-0.038
10				0.038	-0.038	0.038	0.038	-0.038
11				0.038	-0.038	0.038	0.038	-0.038
12				0.038	-0.038	0.038	0.038	-0.038
13				0.038	-0.038	0.038	0.038	-0.038
14				0.038	-0.038	0.038	0.038	-0.038
15				0.038	-0.038	0.038	0.038	-0.038